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10/804,434	03/18/2004	Henry P. Moreton	NVIDP015A/P001241	7140

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EXAMINER	
AMIN, JWALANT B	
ART UNIT	PAPER NUMBER
2628	

NOTIFICATION DATE	DELIVERY MODE
04/15/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/804,434	MORETON ET AL.	
	Examiner	Art Unit	
	JWALANT AMIN	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 January 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-14 and 16-19* is/are rejected.

7)☒ Claim(s) *15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application.
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 1-3, 5-19 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

3. Claims 1-3, 5-15 and 18-19 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. While the claims recite a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. The instant claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.

4. Regarding claim 5, the steps of the claim are directed to a mathematical procedure, which is an abstract idea that does not correspond to any specific real world data. A person can perform the mathematical operation as claimed, using a pen and a paper, without the use of any machine. A machine is not required in performing of any of the steps of the claim, and therefore is neither an explicitly recited structural tie nor inherently involved in the step. Moreover, the method merely performs transformation of data, which could be performed without the use of a machine. It should be further noted that the display step is not an essential step to the overall performing of the process,

and therefore it is neither an explicitly recited structural tie nor inherently involved in the step. Therefore, the claim is not properly tied.

5. Regarding claims 1-3, 6-15 and 18-19, the examiner gives the same reasons as stated above.

6. Regarding claims 16-17, the broadest reasonable interpretation of a "computer readable medium" covers forms of non-transitory tangible media and transitory propagating signals per se in view of the ordinary and customary meaning of computer readable media. The specification does not describe what comprises a computer readable medium. Absent evidence or special definition in the specification for a "computer readable medium", the broadest reasonable interpretation of "computer readable medium" could cover transitory propagating signals, which are non-statutory. Therefore, the claims are rejected under 35 USC 101 as covering non-statutory subject matter.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-2, 9-10, 12-14, 16-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Small (US 5777623).

9. Regarding claim 1, Small (col. 5 lines 25-32 and lines 43-59, col. 6 lines 20-60) teaches modifying a value (x) (texture coordinate t) based on an algorithm (hyperbolic equations),

wherein the value is modified utilizing the equation: $x + \Delta(X)$ (addign the value of differential Δt to the initial value t),

where Δ (differential value) includes a value read from a texture map (it should be noted that differentail value Δt corresponds to change in U or V for a unit change in p, where U and V are coordinates of a texture map),

wherein modifying is based on the a depth-component of the algorithm (it should be noted that the numerator and denominator of the differential depends on the depth values Z,Z_f),

performing an operation (texture mapping, fig. 8 and it's description) on pixel data taking into account the modified value.

10. Regarding claim 2, Small teaches the pixel data includes a normal value (unit vector normal to the polygon, col. 9 lines 10-12), and further comprising modifying the normal value (unit normal has x component; the equations on col. 9 lines 47-50 teaches to modify the x component of the unit normal, col. 9 lines 16-50; it should be further noted that col. 21 lines 4-9 teaches that the texture coordinates or texel values as referred in the reference may also be used for transparency, surface normals, etc.).

11. Regarding claim 9, Small teaches the value includes a depth-value (col. 5 lines 20-33; it should be noted that a renderer receives data defining the pixel position within

the 2-D raster display and a value defining the reciprocal of the depth of the vertex in the eye space).

12. Regarding claim 10, Small teaches the value includes a clip-space z-value (Z is the depth value) (col. 5 lines 20-33; it should be noted that a renderer receives data defining the pixel position within the 2-D raster display and a value defining the reciprocal of the depth of the vertex in the eye space; it should also be noted that Z is the depth value varying from Z_l to Z_r as described in lines 56-57 of col. 5).

13. Regarding claim 12, Small teaches that X involves a projection transform (col. 1 lines 44-55, col. 5 lines 4-6 and lines 19-24; it should be noted that changes in each texel coordinate are a result of a perspective projection of a 3D object from object space to display space).

14. Regarding claim 13, Small teaches that X includes (n * $T_{proj}[y]$), where $T_{proj}[y]$ includes the projection transform, and n includes a vector (col. 1 lines 44-55, col. 5 lines 4-6 and lines 19-24; $T_{proj}[y]$ corresponds to a perspective projection of a 3D object from object space to display space; it should be further noted that as described in col. 9 lines 10-12, a renderer reads the data with respect to each vertex of a polygon and a unit vector normal to the polygon).

15. Regarding claim 14, Small teaches that y equals (3) (col. 1 lines 44-55, col. 5 lines 4-6 and lines 19-24; $T_{proj}[y]$ corresponds to a three-dimensional projection; it should be noted that Small teaches a perspective projection of a 3D object from object space to display space, i.e. an object in a three-dimensional space is converted to a polygon in a two dimensional viewing plane).

16. Regarding claim 16, Small teaches a computer program embodies on a computer readable medium for computer graphics processing (rendering, fig. 8) (col. 4 lines 14-18). It should be further noted that claim 16 is similar in scope to claim 1 and therefore the examiner gives same reasons as above.

17. Regarding claim 17, Small teaches a system (image processing apparatus, fig. 1) including a tangible computer readable medium for computer graphics processing (rendering, fig. 8) (col. 4 lines 14-18), comprising: a graphics subsystem (renderer 52,fig. 2). It should be further noted that claim 17 is similar in scope to claim 1 and therefore the examiner gives same reasons as above.

18. Regarding claim 18, Small teaches the clip-space z-value is extracted using a projection transform (col. 1 lines 44-55, col. 5 lines 4-6 and lines 19-24; $T_{proj}[y]$ corresponds to a three-dimensional projection; it should be noted that Small teaches a perspective projection of a 3D object from object space to display space, i.e. an object in a three-dimensional space is converted to a polygon in a two dimensional viewing plane; it should be further noted that as described on col. 5 lines 20-33, a renderer receives data from the projector 50 defining the pixel position within the 2-D raster display and a value defining the reciprocal of the depth of the vertex in the eye space).

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

20. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Small, and further in view of Leather et al. (US 6,664,958; hereinafter Leather).

21. Regarding claim 7, although Small teaches the claimed limitations as stated above, Small does not explicitly teach the operation includes a hidden surface calculation. However, Leather teaches to apply the pixel depth values resulting from the z blending operation to a hidden surface removal operation (col. 9 lines 55-67 and col. 10 lines 1-5; hidden surface removal operation corresponds to operation includes a hidden surface calculation; col. 9 lines 29-32, depth (z) corresponds to depth value or z-value). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to use the hidden surface removal operation of Leather and apply it into the system of Small because using hidden surface removal operation in conjunction with the z buffer allows the z texture to control whether parts of the texture mapped image are occluded by other objects in the scene (col. 10 lines 3-5).

22. Claims 8, 11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Small, and further in view of Foran et al. (US 5742749, hereinafter Foran).

23. Regarding claim 8, although Small teaches the limitations as stated above, Small does not explicitly teach that the operation includes a shadow mapping. However, Foran teaches exactly the same (col. 2 lines 2-45; using elements of z-buffering and projective texture mapping to create the shadow effect). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to apply the known

knowledge of Foran to the system of Small because such a system creates a realistic shadow effect (col. 2 lines 43-45).

24. Regarding claim 11, although Small teaches the limitations as stated above, Small does not explicitly teach that depth value z is same as w. However, Foran (col. 6 lines 64-66) teaches that the depth value z is known as w, when iteration of a coordinate for a non-projected texture takes place in the viewer's coordinate system. Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to apply the known knowledge of Foran to the system of Small to yield predictable results.

25. Regarding claim 19, Small teaches to the clip-space w-value is extracted using a projection transform (col. 1 lines 44-55, col. 5 lines 4-6 and lines 19-24; $T_{proj}[y]$ corresponds to a three-dimensional projection; it should be noted that Small teaches a perspective projection of a 3D object from object space to display space, i.e. an object in a three-dimensional space is converted to a polygon in a two dimensional viewing plane; it should be further noted that as described on col. 5 lines 20-33, a renderer receives data from the projector 50 defining the pixel position within the 2-D raster display and a value defining the reciprocal of the depth of the vertex in the eye space).

Although Small teaches the limitations as stated above, Small does not explicitly teach that depth value z is same as w. However, Foran (col. 6 lines 64-66) teaches that the depth value z is known as w, when iteration of a coordinate for a non-projected texture takes place in the viewer's coordinate system. Therefore, it would have been

obvious to one of ordinary skill in the art at the time of present invention to apply the known knowledge of Foran to the system of Small to yield predictable results.

26. Claims 3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Small and Foran, and further in view of Randel (US 6362822).

27. Regarding claim 3, although Small teaches the claimed limitations as stated above, Small does not explicitly teach the operation includes a lighting operation. However, Foran teaches exactly the same (it should be noted that using the projective texture mapping means, coordinates are generated in the light coordinate system, col. 14 lines 24-31). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to use texture mapping means to generate coordinate of a light coordinate system as taught by Foran and use it into the system of Small because such a system provides a shadowing technique that may be used for interactive image generation (col. 2 lines 14-16).

Although Small teaches the limitations as stated above, Small does not explicitly teach that light coordinates are generated based on changes in a pixel data. However, Randel teaches exactly the same (col. 11 lines 14-27; it should be noted that Randel teaches that portion of the pixels that are changed are then transformed and processed to generate modified light depth data). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to use the knowledge of Randel and apply it into the system of Small and Foran because such a system can be used in

rendering lighting and shadows in computer graphics simulation of multi-dimensional objects (col. 1 lines 6-10).

28. Regarding claim 5, Small (col. 5 lines 25-32 and lines 43-59, col. 6 lines 20-60) teaches modifying a value (x) (texture coordinate t) based on an algorithm (hyperbolic equations),

wherein the value is modified utilizing the equation: $x + \Delta(X)$ (addign the value of differential Δt to the initial value t),

where Δ (differential value) includes a value read from a texture map (it should be noted that differentail value Δt corresponds to change in U or V for a unit change in p, where U and V are coordinates of a texture map),

wherein modifying is based on the a depth-component of the algorithm (it should be noted that the numerator and denominator of the differential depends on the depth values $Z_i Z_r$),

performing an operation (texture mapping, fig. 8 and it's description) on pixel data taking into account the modified value.

Although Small teaches the claimed limitations as stated above, Small does not explicitly teach a lighting operation to display an interaction of objects. However, Foran teaches to generate coordinates in light coordinate system (it should be noted that using the projective texture mapping means, coordinates are generated in the light coordinate system, col. 14 lines 24-31; col. 2 lines 14-16). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to use texture mapping means to generate coordinate of a light coordinate system as taught by Foran and use it

into the system of Small because such a system provides a shadowing technique to be used for interactive image generation (col. 2 lines 14-16).

Although Small and Foran teach the limitations as stated, they do not explicitly teach modifying (modified depth data) allows lighting operation (using light coordinates) to display an interaction of displayed objects using the light coordinates (figs. 7A-D, col. 11 liens 14-27; col. 1 lines 6-10 teaches rendering lighting for interactive graphics simulation of multi-dimensional objects). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to use the knowledge of Randel and apply it into the system of Small and Foran because such a system can be used in rendering lighting and shadows in computer graphics simulation of multi-dimensional objects (col. 1 lines 6-10).

29. Regarding claim 6, although Small teaches the limitations as stated above, Small does not explicitly teach that the modifying allows a lighting operation to display bumpy shadows. However, Foran teaches exactly the same (col. 2 lines 2-45; using elements of z-buffering and projective texture mapping to create the shadow effect). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to apply the known knowledge of Foran to the system of Small because such a system creates a realistic shadow effect (col. 2 lines 43-45).

Although Small and Foran teach the limitations as stated, they do not explicitly teach modifying (modified depth data) allows lighting operation (using light coordinates) to display shadows using the light coordinates (figs. 7A-D, col. 11 liens 14-27; col. 1 lines 6-10 teaches rendering lighting for interactive graphics simulation of multi-

dimensional objects). Therefore, it would have been obvious to one of ordinary skill in the art at the time of present invention to use the knowledge of Randel and apply it into the system of Small and Foran because such a system can be used in rendering lighting and shadows in computer graphics simulation of multi-dimensional objects (col. 1 lines 6-10).

Allowable Subject Matter

30. Claim 15 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

31. The following is a statement of reasons for the indication of allowable subject matter:

32. Regarding claim 15, please refer to the arguments presented on pages 23-34 of the appeal brief regarding allowable subject matter.

Response to Arguments

33. Applicant's arguments filed 2/2/2009 have been fully considered but they are not persuasive.

34. Applicant's arguments, see pages 12-25 of appeal brief, filed 1/14/2010, with respect to the rejection(s) of claim(s) 1-19 under USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

However, upon further consideration, a new ground(s) of rejection is made in view of Small (US 5777623).

35. Applicant's arguments regarding claims 1-3, 5-15 and 18-19 have been fully considered but they are not persuasive.

36. Regarding claims 1-3, 5-15 and 18-19, the applicant argues "... by virtue of claimed 'performing', applicant clearly teaches and claims a 'transformation' of an article or physical object to a different state or thing" (see pg. 11-12 of appeal brief).

37. However, the examiner disagrees. The examiner interprets that claims 1-3, 5-15 and 18-19 are directed to a mathematical procedure, which is an abstract idea that do not correspond to any specific real world data. A person can perform the mathematical operation as claimed, using a pen and a paper, without the use of any machine. A machine is not required in performing of any of the steps of the claims, and therefore is neither an explicitly recited structural tie nor inherently involved in the step. Moreover, the method merely performs transformation of data, which could be performed without the use of a machine. Therefore, the claims are not properly tied. Therefore, the rejection under USC 101 is valid. Please refer to the claim rejections above for details regarding USC 101 rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JWALANT AMIN whose telephone number is (571)272-2455. The examiner can normally be reached on 10:30 a.m. - 7:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kee Tung can be reached on 571-272-7794. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kee M Tung/
Supervisory Patent Examiner, Art Unit 2628

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